REMARKS/ARGUMENTS

In response to the Office Action mailed June 3, 2005, Applicants amend their application and request reconsideration. In this Amendment claim 8 is cancelled leaving claims 1-7 pending.

Certain clarifying amendments are made in claim 1 in response to the claim objection. The word "paraboloid" and similar words no longer appear in the claims. The final paragraphs of claim 1 are amended for clarity. The former final paragraphs of claim 1 make clear that an important feature of the invention is that the distribution of divergence angle of the light flux at the outgoing surface of the lamp front glass is constant with respect to distance from the optical axis, measured perpendicular to the optical axis. This clarification is supported by the patent application at numerous locations, for example, page 20, line 29 to page 21, line 3, page 22, lines 11-20, and page 26, lines 4-9. The claim amendments make clear the divergence angle at the outgoing surface of the lamp front glass remains constant with regard to the separation of the corresponding light flux from the optical axis.

Claim 3 is amended for clarity. This amendment is based upon at least the passage appearing at page 26, lines 15-18 of the patent application. A translational error in claim 3 is corrected. Clearly, the word "optional" was intended to be "arbitrary".

A point of the invention is the ability to produce a beam of light having a uniform divergence angle at the outgoing surface of the lamp front glass, with respect to distance from the optical axis. This constant divergence angle over a fixed area is matched to the input area of a rod integrator, for example in a projection system. The ability to control the size of the area in which the divergence angle is constant leads to a brighter and more uniform image in a projection system.

Claims 1-4 and 6 were rejected as obvious over Akiyama (U.S. Patent 6,688,756) considered by itself. Claims 5 and 7, dependent claims, were rejected as obvious over Akiyama in view of Karasawa et al. (U.S. Patent 6,491,396, hereinafter Karasawa). These rejections are respectfully traversed, particularly with respect to the claims now presented. It is apparent that if claim 1 is not obvious in view of Akiyama, that all of claims 1-7 are patentable over the prior art applied in rejecting the formerly pending claims.

The difference between the invention as defined by the formerly pending claims and Akiyama, accounting for the rejection for obviousness rather than for anticipation, is not expressly stated in the Office Action. It is presumed that the difference is allegedly supplied by "Official Notice", namely the unidentified optical technology textbooks and calculus books referred to in the Office Action. This implicit reliance upon "Official Notice" is traversed and the Examiner is challenged to cite appropriate prior art publications if he intends to maintain the former rejection or make a new rejection. However, for the reasons that follow, the invention as defined by the claims now pending is clearly patentable over Akiyama.

As already noted, an important feature of the invention is that the divergence angle distribution at the outgoing surface of the lamp front glass is constant. This feature of the invention is best understood with respect to the description in the patent application pertaining to Figures 10A, 10B, 11A, and 11B that appears from page 22, line 16 through page 26, line 18 of the patent application. While translational errors in the specification may require close attention to the cited passage, one of skill in the art can easily derive from the passage an understanding of the prior art described in the patent application, the invention, and the differences between that prior art and the invention. Then, this understanding can be applied to the disclosure of Akiyama to understand why the rejection cannot properly be maintained.

In the cited figures, Figures 10A and 11A represent a prior art structure and Figures 10B and 11B illustrate the functioning of an embodiment of the invention. The conventional lamp as illustrated in Figures 10A and 11A includes a parabolic reflecting surface 101b. As stated by the Examiner, when light at the focus of the parabolic reflector is reflected from the reflecting surface, the result is the production of the parallel flux, i.e., a flux of light including parallel light rays. The statement in the Office Action that suggests that the parallel light rays would be produced regardless of whether the light source is located at the focus of the paraboloid is, of course, incorrect and understood to be inadvertent.

As shown in the prior art Figure 10A, the light so reflected from the parabolic surface 101b forms parallel rays at a virtual plane S0. However, as is apparent from that figure and the convention in the art, the distribution of these light rays is not uniform along that virtual plane. Rather, there is a dead spot in the center of the plane along the optical axis Z. Moreover, when the parallel light flux passes through the planar front glass 101c, the light

rays diverge as illustrated in prior art Figure 11A. Because the light rays are not uniform in distribution across the plane S0, the angle of divergence is not constant along that plane. As is apparent in Figure 11A, the angle of divergence is substantially larger closer to the optical axis Z as shown at the area 108a, than the angle of divergence at the area 108b which is farther away from, i.e., more remote from, the optical axis Z. The invention overcomes this problem.

As shown in the embodiment illustrated schematically in Figures 10B and 11B, the parallel light rays are not parallel at the virtual plane S1 but are parallel at the outgoing surface of the lamp front glass 1c. This result occurs because the reflecting surface 1b is not parabolic, although the source of light is located at the focus of the reflecting surface of revolution 1b. Further, the embodiment of Figure 10B provides a more uniform distribution of light rays along the plane S1 than in the prior art. Therefore, as illustrated in Figure 11B, along the outgoing surface of the front glass 1c, the angle of divergence is substantially uniform with respect to distance perpendicular to the optical axis. This result is illustrated in Figure 11B where it can be seen that there is relative uniformity between the angles of divergence at areas 4a and 4b, respectively located close to and remote from the optical axis Z.

Turning to Akiyama, it appears that the Examiner is directing attention to the description in Akiyama that pertains to Figures 2 and 3. Akiyama describes his reflecting surface 24R as elliptical. As well known to those of ordinary skill in the relevant arts, an elliptical reflector includes two foci, designated FR1 and FR2 in Figure 3 of Akiyama. A source of light is placed at that first focus and produces a non-parallel light flux when reflected from the reflecting surface 24R. Then, through the use of the aspherical lens 30A, Akiyama allegedly produces a flux of light with parallel rays as illustrated schematically in Akiyama's Figure 2. This result is achieved with the plano-concave lens 30A having a refractive surface with a shape described by the mathematical formula appearing in column 6 of Akiyama and to which the Examiner directed attention.

It is apparent that the schematic diagram of Figure 2 of Akiyama indicates that the density of light rays is not uniform along the plane 30ALD that is perpendicular to the optical axis 20ax in Akiyama. Thus, Akiyama clearly does not meet the terms of claim 1, particularly as presented here. The uneven distribution of light rays across the plane 30ALD

means that the divergence angle of those light rays is a function of position along that plane, unlike the invention as described in amended claim 1.

If Akiyama were to make obvious the invention as described by the claims presented here, Akiyama would have to include some suggestion for further modification of the structure shown in Figure 2 of Akiyama to produce the substantially constant distribution of divergence angles along the plane perpendicular to the optical axis. There is no disclosure of even the desirability of that result in Akiyama, much less a suggestion of how that result might be achieved. Further, it is apparent from Akiyama that the optical structure illustrated there, even with the addition of the elements of Akiyama's Figure 11, does not function to reduce the size of the dead zone about the optical axis, an important result achieved in the invention.

Because of the foregoing differences between the claim 1 presented here and Akiyama, amended claim 1 is clearly distinct from and patentable over Akiyama as are claims 2-7. Since, as already discussed, Karasawa is only related to limitations of dependent claims 5 and 7, further discussion of the rejection of claims 5 and 7 is not necessary. The rejection is traversed because Akiyama fails to support the rejection of claim 1, an essential component of the rejection of claims 5 and 7.

To the extent not set forth at length here, the arguments previously presented in distinguishing the invention from Akiyama are maintained. Most specifically, Applicants maintain that Akiyama fails to describe a lamp reflector for which the ratio $dr/d\theta$ is constant, further distinguishing the invention from Akiyama.

Reconsideration and allowance of all of the claims now pending are earnestly solicited.

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